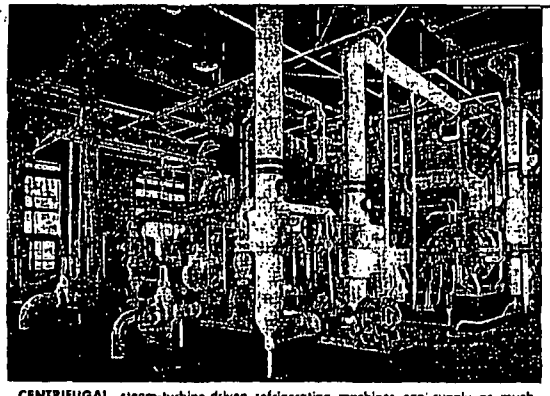
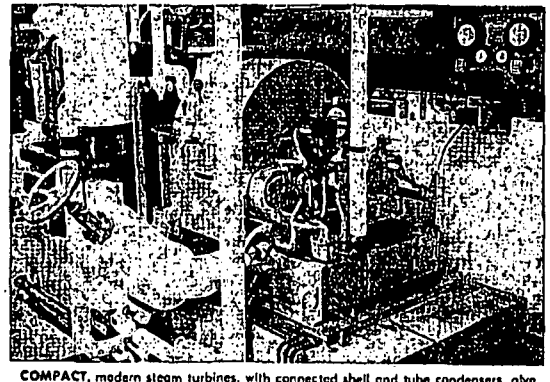
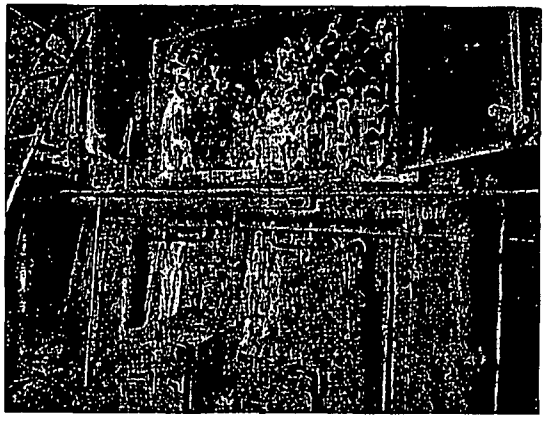


CENTRIFUGAL, *steam-turbine-driven refrigerating machines can supply as much as* 1800 gpm chilled water at 36 F to individual buildings' air-conditioning systems



COMPACT, modern steam turbines, with connected shell and tube condensers, give an efficient, low-cost power generation, with a minimum of operating attendance

HOPELESS operating and maintenance problems in old plant show in this photo of badly neglected watertube boiler, choked by boiler scale and piping fouled-up



show more than the new and the old. They picture the complete revolution that institutional buildings have undergone in planning their engineering services. The old "necessary evil" days of power plants look like they're a thing of the past. Here, though, are some of the terrific penalties poor water conditions laid on the old plant. Read on, and you'll appreciate why we went all out on the new powerhouse.

Boiler scale was so heavy and built up so fast the operators couldn't keep up with it. As recently as 1948, boilers were shut down for cleaning only after they were so clogged up they couldn't produce effectively any more. Under the old system it had to be that way: we would just finish a clean-up job on one boiler when the next one would break down. When I first took over as chief engineer there were scale build-ups that reached a solid foot of honeycomb on front and back headers because of leaky handhold plates—enough to push doors partly open, photo, p 105.

Return lines were just as sorely in need of attention. When the heavily-scale-loaded feedwater broke down under boiler heat, CO_2 carried over at a merry clip into steam mains and showed up in a dangerously low pH return water. Return lines looked like they had had a prime coat of red lead. Every time a maintenance man went out to replace a nipple he'd wind up putting in a whole new section.

But because we had the new plant under way the State Boiler Inspection Division, which had condemned the old boilers, let us continue running them. By dint of heavy blowdown and a make-shift water treatment we got by.

New Plant. In February 1949, we cut out the old and turned on the new power plant. The boiler-room gang gathered up their belongings and moved lock and baggage to the new plant. One of the fellows was so impressed when he reached the "palace" he took off his shoes and tiptoed to the locker room.

The primary purpose of the new plant is to furnish steam, air and chilled water through a 6x4-ft, 1060-ft-long tunnel to a new dental college, the Truett Memorial Hospital, Baylor Hospital, Florence Nightingale Maternity Hospital, a library building and a 5-story nurses' home.

The power plant houses three 3-drum watertube boilers (see Equipment Table), equipped with automatic-control natural-gas burners plus manually-operated standby oil burners. Results have been first rate. Plant runs with a CO_2 range of 8-10.5% burning natural gas. Furnaces are solid-wall construction; no spot blowers are needed with natural gas. Inside walls were sprayed with a high-temperature, super-duty refractory surfacing material that has worked out well. After the boilers put in a year on the line it was assumed the walls had expanded and cracks opened to the limit. We then applied a protective coating to the outside boiler settings, see photo of new boiler, p 105.

One of our troubles in the old plant had been pump-suction problems from too low a head. So this time we put an open feedwater heater, 69,000-lb-per-hr capacity, 25 ft above the pumps. In addition, automatic controllers hold the water level constant within the heater at a point well above this 25-ft level. The condensate pump takes its suction from a 6x12-ft surge tank that receives all pumped returns from the buildings.

Instrument Board. As you might guess, the new plant features all necessary instruments, see equipment table. It has two panelboards—a main one in the boiler room and a smaller one spotted near the turbines.

Water treatment, of course, receives full attention. Our water supply now comes from city mains. It is led through two sodium zeolite tanks to reduce its average incoming hardness of 5 gr per gallon to practically zero. About every 430,000 gal the zeolite has to be regenerated to keep it at top performance.

In addition to this pretreatment soda ash and trisodium phosphate is added to the boiler water. Sodium sulfite acts as a scavenger in the feedwater to remove any traces of oxygen left after the deaerating-heater stage.

Cooling towers get daily treatments of sodium hypochlorite and sodium bichromate. The sodium hypochlorite holds the algae and fungus in check and the sodium bichromate controls corrosion in the circulating-water lines. Cooling-tower water-basin level is lowered about halfway every three months; then is refilled with softened water from the zeolite units. What's more, we use some softened water returning to the surge tank as a coolant in the air compressor aftercoolers.

All in all, Baylor's got a smooth-working plant that it's a pleasure to operate. So maybe the old nightmare did them a good turn. Without the experience it gave them, the new plant might not have been so complete.

Typical Raw Water From Wells in Dallas Area

Calcium	82
Magnesium	38
Total hardness	120
Sodium & potassium	518
Total cations	638
Sulfate	8
Chloride	170
Mineral acid ions	178
Bicarbonate	460
Carbonate	
Hydroxide	
Total anions	638

PRINCIPAL POWER-PLANT EQUIPMENT

Baylor Hospital, Dallas, Texas

STEAM-GENERATING EQUIPMENT:

Boilers ..... Babcock & Wilcox Co
One, Type H, 3-drum, 5018 sq ft heating surface
One, Type H, 3-drum, 4150 sq ft heating surface
Economizer ..... Erie City Iron Works
One, 3-drum, 3000 sq ft heating surface
Deaerating heater, 1 ..... Condenser Service & Engineering Co
Fuel-oil pumping equipment, complete assembly ..... Ray Oil Burner Co
Water softener, 1 ..... Elgin Softener Corp
Cooling tower, 1 ..... The Marley Co
Combustion controls and burners ..... Webster Engineering Co

BOILER INSTRUMENTS:

Draft gages ..... Hays Corp
Water gages ..... Republic Flow Meters Co
Steam-flow recorder ..... The Foxboro Corp
Feedwater flowmeters ..... Brown Instr Div, Minneapolis-Honeywell Regulator Co
Fuel-oil steam flowmeters ..... Republic Flow Meters Co
Boiler-steam-pressure recorder ..... Brown Instr Div, Minneapolis-Honeywell Regulator Co
Flue-gas-temperature recorder ..... The Foxboro Co

TURBINES AND ACCESSORIES:

Turbines ..... Westinghouse Electric Corp
One, 333 hp, Type C32S, trip speed, 4400 rpm
One, 437 hp, Type C32S, trip speed, 5850 rpm
Condensers ..... Coppus Engineering Corp
Two, 1 hp, Type TF-9, 3500 rpm; two, 1½ hp, Type TF-9, 3500 rpm
Surface condensers ..... Kewanee-Ross Corp
Steam jet ejectors ..... Kewanee-Ross Corp
Atmospheric relief valves ..... Atwood & Morrill Co

AIR-CONDITIONING EQUIPMENT, PUMPS, COMPRESSORS:

Refrigeration machines, 2 ..... Carrier Corp
One, 855-ton unit, complete; one 400-ton unit, complete
Centrifugal pumps, 9 ..... Allis-Chalmers Mfg Co
One, 3½x3½, condensate, 5-hp motor
One, 10x10, condensate, 100-hp motor, 2505 gpm, 90-ft head
One, 8x8, condensate, 40-hp motor, 1200 gpm, 95-ft head
One, 8x8, chilled water, 60-hp motor, 1350 gpm, 120-ft head
One, 6x6, chilled water, 30-hp motor, 600 gpm, 120-ft head
Two, 1¼x1¼, hotwell (steam turbine driven), 20 gpm, 25-ft head
Two, 1¼x1¼, hotwell (steam turbine driven), 15 gpm, 25-ft head
Feedwater pumps, 2 ..... Worthington Corp
10x7x10, steam-driven, duplex
Condensate pump, 1 ..... Union Steam Pump Co
3½x3½x5, steam-driven, duplex
Air compressors, 2 ..... Worthington Corp
8x7, including aftercoolers
Air compressors, 2 ..... Reliance Electric & Engineering Co
20 hp, 208 v, 3 ph, 60-cycle motors

ELECTRICAL CONTROLS, METERS:

Switchboard and breakers ..... Buara D Co
Starters ..... Allen-Bradley Co
Volt and ampere meters ..... Roller-Smith
Kwhr meter ..... Westinghouse Electric Corp
Transformers, 2, 300 kva, air cooled ..... Sorgel Electric Co

VALVES, GAGES, THERMOMETERS:

Miscellaneous sizes, globe, gate, straight and angle types ..... Crane Co; Walworth Co; Stockman Valves & Fittings Co
Blowoff valves, boilers ..... Everlasting Valve Co
Safety valves, B&W boilers ..... Crosby Steam Gage & Valve Co
Safety valves, Erie City boilers ..... Consolidated-Ashcroft Div, Manning, Maxwell & Moore Co
Water columns and prismatic glasses ..... *Reliance Gage Column Co*
Pressure-reducing valves ..... Spence Engineering Co
Excess-pressure regulators, feed pumps ..... McAlear Mfg Co
Boiler-water regulators ..... The Swartwout Co
Fuel-oil storage-tank gages ..... The Liquidometer Corp
Boiler gages..Consolidated-Ashcroft Div, Manning Maxwell & Moore Co
Gages, all others ..... Crosby Steam Gage & Valve Co
Thermometers ..... Weksler Thermometer Corp

MISCELLANEOUS EQUIPMENT:

Traps, strainers ..... Sarco Co
Lubricators ..... McCord Corp
Hot-water generator ..... American District Steam Co

CONTRACTORS:

Architects and engineers ..... Thomas, Jameson & Merrill
General contractors ..... Inge, Hayman Constr Co
Consulting engineers ..... Zurawth & Winther
Plumbing and heating ..... C Wallace Plumbing Co
Electrical contractors ..... Superior Electric Co